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ABSTRACT

A total of 94 ninth and tenth grade students participated in a study to determine which of the following six reading expectancy formulas predict actual reading achievement of secondary school students of average intelligence: the Dechant formula, the Harris I formula, the Science Research Associates' "Tests of General Ability," the Harris II formula, the Los Angeles formula, and the Bond and Tinker formula. Reading achievement scores and intelligence scores were obtained for all students. Each of the six reading expectancy scores was then correlated with the observed reading scores of each student, using the Pearson product-moment correlation coefficient. Each score was then correlated with every other expectancy score to determine the intercorrelation of the formulas. The results revealed that, at a particular grade level, no one formula predicted reading achievement better than any other. In addition, it was found that the correlation between the formulas was extremely high, indicating that they were essentially assessing the same phenomena. (Author/FL)

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A COMPARISON OF SELECTED READING EXPECTANCY FORMULAS WITH READING ACHIEVEMENT FOR NINTH AND TENTH GRADERS

A THESIS

SUBMITTED TO THE FACULTY

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OF

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"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

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BY

KATHLEEN FLYNN

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CHAPTER I

THE PROBLEM

Background

The education pendulum in New Jersey, in 1977, has swung from a liberal, individualized approach to education to a basic skills, minimum competency program. This philosophy mandates testing and remediation to a prescribed level. Notwithstanding the goal of equalization inherent in programs, such as a "Thorough and Efficient" education, the classroom teacher must still deal with the individual student's needs and abilities.

Although many assume that the teaching of reading is a job for the elementary school teacher, secondary schools are finding it increasingly necessary to involve themselves in the business of teaching reading. Because of the State Compensatory Education Program, high school teachers and administrators are being forced to deal with reading grade levels, minimum reading levels, standardized testing, and methods of selecting students for the Compensatory programs. The selection process usually includes some discussion of reading potential.

As Bond (1941) points out, it is not enough to assume that a child at the end of 10th grade, for example, should be reading at 10.9 level. If reading age and mental age are about the same, even a reader retarded two years should not be offered remedial instruction. At the high school level, consideration must also be given to other factors.

Here, unlike elementary school, work and social life play a greater part in determining a child's response to school. Strang (1969) adds the factors of concentration, attention, motivation, attitudes, values, and self-concept to be considered in determining reading potential.

Recognizing the many limitations of determining reading potential, there is a growing concern with the best method for assessing this potential. Dechant (1973), when writing about reading at the secondary level, claims that "without knowing a student's potential, education is target practice in the dark" (p. 344). He states that the first step in diagnosis, at the secondary level, involves an analysis of reading potential or reading expectancy level with reading achievement. Harris (1975) discusses student potential, "Reading expectancy should be an informed estimate of the level of reading achievement that can realistically be expected of an individual when the relevant facts are known" (p. 147). Betts (1950) postulates at least two reasons for emphasizing expectancy: "first, to identify pupils who are not achieving in terms of their capacities; second, to avoid insistence upon participation in certain types of reading activities by pupils who do not stand to profit from them" (p. 483).

Thus the question becomes the practical one of which formula to choose in determining expectancy. Expectancies will vary with the formula chosen, because of the varying input and the tests chosen to compute the formula. The problem is to determine which formula approximates reading achievement best.

Statement of the Problem

This study will attempt to determine which of these following

six formulas predict actual reading achievements of two ninth- and two tenth-grade classes of a classified "average" intelligence group:

1. Dechant Formula;

2. Harris I Formula;

3. Science Research Associates' Tests of General Ability, hereinafter referred to as the TOGA Formula;

4. Harris II Formula;

5. Los Angeles Formula; and

6. Bond and Tinker Formula.

The data was analyzed in order to answer the following questions:

1. What was the relationship between each of the expectancy formulas and reading achievement as it related to average ninth and tenth graders in a middle class group?

2. What was the relationship between the six expectancy formulas?

Importance

There has been general discussion concerning the predictive validity of expectancy formulas in relation to the validity of testing and measurement in general, but few studies have been concerned with the accuracy of the formulas themselves.

Simmons and Shapiro (1968) tested the formulas for predicting remedial students. Goodman (1973) wanted to see if the formulas were sufficient for predicting reading achievement after remedial instruction. Rodenborn (1974) used the formulas to evaluate a basal reader program. Only the Bragg (1971) and Dore-Boyce, Misner and McGuire (1975) studies compare expected and observed reading grades and then

with conflicting results on similar groups. This study will compare expected and observed reading grades of two average ninth-grade classes and two average tenth-grade classes using six formulas.

Definition of Terms

For the purpose of this study, these definitions are proposed.

Reading Achievement: The grade level at which a student is reading as obtained from the Total Reading Score on the Comprehensive Tests of Basic Skills, Expanded Edition, Level 4, Form S.

Reading Expectancy: The grade level of reading achievement predicted for a student as determined by a given formula.

Limitations of the Study

This study used 56 ninth-grade students and 38 tenth-grade students from Madison Central High School in Old Bridge Township, New Jersey. This is a predominately middle class suburban area with representation from both the lower and upper socio-economic groups. The percentage of any racial or religious minority students is low. The results may not hold true for different sections of the country or for urban areas.

Three formulas were excluded from this study: The Monroe Formula, the Cleland Formula, and the Durrell-Listening Reading Test Formula.

Monroe Formula

One of the earliest formulas was developed by Marion Monroe (1932). This is one of the more complicated formulas, which may account for the reason it is not included in a number of recent studies

comparing expectancy formulas: (Dore-Boyce et al. 1975; Rodenborn, 1974; Goodman, 1973). For the purpose of arriving at a single measure of reading defect, Monroe developed the Reading Index, which takes into account chronological age, mental age, and arithmetic age.

$$RI = \frac{\text{Reading Grade}}{\text{Expectancy Grade}}$$

The Reading Grade is obtained by averaging a battery of tests. Monroe used Gray's Oral Reading Paragraphs, the Haggerty Reading Test (below third-grade achievement) or the Monroe Silent Reading Test (third-grade achievement or above) and the Iota Word Test and the Word-Discrimination Test from the Monroe Diagnostic Reading Tests.

The Expectancy Grade is the average of the chronological age, mental age, and the grade score on the Arithmetic Computation Test.

$$RE = \frac{CG + MG + AG}{3}$$

Cleland Formula

Cleland (1964), in a formula recommended by Wilson (1967) as the preferred formula for a precise clinical diagnosis, adds a listening-comprehension (auding) score (Durrell-Sullivan Reading Capacity Test) and gives it equal weight with Mental Age, Chronological Age, and Arithmetic Computation Age. He subtracts 5 from the Chronological Age and Mental Age each for years not in school and then averages the four scores for a reading potential which can be compared to reading achievement.

$$RE = \frac{(CA-5) + (MA-5) + \text{Arith. C} + \text{D/S Cap.}}{4}$$

Durrell-Listening Reading Test Formula

Listening comprehension, auding, is another measure of measuring reading potential. The rationale is to find the highest level a child can comprehend material read to him and compare that with the reading level of similar material. The manual for the Durrell-Listening Reading Series states:

> The ability to understand spoken English demonstrates that the child has the intelligence and perceptual abilities to handle words and sentences, the basis for all later communication abilities: speaking, reading, and writing. Listening comprehension is more directly related to reading than are most tests of intelligence. (p. 10)

A chart is given where the Listening Raw Score is equated with a Potential Reading Grade Equivalent. The Reading Raw Score is then equated with a grade equivalent and the difference measures reading disability.

These formulas were not included because of their complexity and the large blocks of time that would have been needed to administer the necessary tests to compute these formulas. It is the opinion of this writer tha public educators would not consider these measures of reading potential because of the costs involved and the amount of time which would have to be taken from instruction time. They are perhaps better suited to private schools, tutors, or reading clinics. A description of these formulas has been included for information purposes.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Literature dealing with expectancy formulas covers the rationale behind each formula and studies of the expectancy formulas. Since this study is concerned with the comparison of expectancy formulas and actual reading achievement, the review of the literature will concentrate on studies of the expectancy formulas. The rationale behind each formula is presented under the descriptions of the formulas.

Studies of Expectancy Formulas

Simmons and Shapiro (1968) compared the Harris I, Bond and Tinker, and the Los Angeles Formulas to identify remedial students with an IQ range of 60-140, at grades 6.0, 8.0, 10.0 and 12.0. They found that in the upper IQ range the Harris Formula provided the highest expectancy and that in the lower range the Bond and Tinker yielded the highest expectancies. The Los Angeles assumed a position roughly midway between the two. The three formulas approached agreement only in the middle IQ range.

The problem of discrepancy in expected levels is compounded at the secondary high school level for students in the upper IQ range, where a student may score beyond the mean for any actual grade placement. There is a flattening of the learning curve at this level, and a grade score of 19.3 is not meaningfully different from a score of 17.5.

The problem with all formulas is that they are all based on one or more standardized test scores and that the expectancy will vary with the types of scores used and the relative weights assigned to them. For this reason, the authors caution that all expectancy formulas should only be used as an aid in ranking students.

Bragg (1971) compared the predictive ability of the six formulas: the TOGA, Harris I, Los Angeles, Bond and Tinker, Listening Skills (Durrell-Sullivan Reading Capacity and Achievement Tests), and the Monroe on a group of 81 children from average reading groups from grades 3 through 6.

The correlation of five of the formulas was between .42 and .62, the Los Angeles being the highest. The Harris Formula was much lower at .08. Bragg (1971) used the Science Research Associates' Tests of General Ability to obtain a nonverbal IQ. The arithmetic score was obtained from the Metropolitan Achievement Tests - Elementary Form A for third and fourth grades and Intermediate Form A of the same test for fifth and sixth grades. The reading scores were obtained from the Gates Mac Ginitie Reading Test.

Rodenborn (1974) used the Harris II, Bond and Tinker and Horn-Los Angeles Formulas to evaluate the success of a new basal reader program. They found that (1) the Harris Formulas excluded children of low IQ's from remedial programs; (2) the Bond and Tinker excluded most children of high IQ performing near grade level; and (3) the Horn Formula was a "happy medium." Rodenborn found that differences in the programs studied, which showed up in the Harris Formula, were masked by the Bond and Tinker Formula.

This study confirms Harris' claim that the Bond and Tinker Formula predicts the actual achievement of higher IQ pupils, discounting the possibilities that better programs would stimulate these students to reach their potential. Rodenborn feels that all three formulas should be used to give a range of potential, thereby not unduly pressuring nor limiting the students.

Dore-Boyce, Misner and McGuire (1975) compared the expected and observed reading grades of 733 fourth and fifth graders using the Bond and Tinker, Harris I, Harris II, and the Horn-Los Angeles Formulas. The correlations range was from .47 (Bond) to .69 (Harris I). In the IQ interval 70-89, none of the correlation coefficients were significant. For all IQ's over 90, however, the correlations were statistically significant, thereby making prediction by formulas valid. A multiple step-wise regression analysis found that the single best predictor of reading level in grades four and five was Mental Age (Harris I).

The IQ scores in this study were obtained from the Otis-Lennon Mental Ability Test. Arithmetic and reading scores were from the Science Research Associates Achievement Series. The reading is the grade equivalent of the total of the Vocabulary and Reading Comprehension subtests.

Goodman (1973) compared the Harris I, Los Angeles, Bond and Tinker, TOGA, and Goodman Formulas for the purpose of predicting reading achievement of 36 junior high students, after 50 hours of remediation. The Goodman Formula, which was introduced as a measure of predicting remedial gains was,

RP = Reading Potential
RA = Reading Achievement

$$RP = 2\left(\frac{\text{Pretest RA}}{\text{Years in School}}\right) + \text{Pretest RA level}$$

This formula had a correlation with posttest achievement of .92.

The other formulas were from a low .33 (Bond and Tinker) to a high of .71 (both Los Angeles and the TOGA). Even with the .71 correlation the mean difference between formulas and tested achievement was 3 years, thereby prompting Goodman (1973) to conclude that none of the standard formulas were valid for predicting achievement after 50 hours of remediation.

The input for the formulas was obtained from the Science Research Associates' Tests of General Ability, Verbal and Reasoning. Reading scores were from the Gates-MacGinitie Reading Tests and for the six lowest achievers, the Stanford Achievement Test, Primary I.

Summary

The early discussions of reading expectancy formulas were directly related to discussion of the validity of intelligence testing. While there now seems to be a general recognition of the problem of testing, there is also the recognition that testing is generally useful for some type of ranking of students. Reading experts have chosen the criteria for the various expectancy formulas and the more recent studies are comparing how well these formulas correlate with actual reading achievement.

This paper differs from previous studies in that it evaluates how well the six most used formulas predict actual reading achievement

at the secondary level. Other studies have compared a number of formulas to determine the closeness of expectancy levels. Only the Bragg (1971) and the Dore-Boyce et al. (1975) determined correlation with actual reading achievement and then at the elementary level. The Harris II Formula has been included in only one other study, the Dore-Boyce et al. (1975).

CHAPTER III

PROCEDURE

Subjects

This study used two ninth and two tenth-grade average reading groups from Madison Central High School. This is based on a three track classification in the high school; A superior, college bound, B average, and C below grade level and remedial. Altogether, 38 ninth graders and 56 tenth graders were tested. The majority of the students were white, from a socio-economic middle class suburban area.

Collection of Data

The formulas utilize some combination of these four variables (Chronological Age, Mental Age, IQ, and Years in School) as outlined in Table 1.

TABLE 1

VARIABLES USED IN COMPUTING FORMULAS

Test	IQ	Chronological Age	Mental Age	Years in School
DECHANT	X	X	X	
HARRIS I	X	X	X	
TOGA	X	X	X	
HARRIS II	X	X	X	
LOS ANGELES	X	X	X	
BOND AND TINKER	X			X

Tests Used

Test of General Ability

The TOGA Formula required the administration of the Science Research Associates' Tests of General Ability for grades 9-12. This test was also used to compute the IQ scores necessary for the formula input. While an individual IQ test is preferable to a group test, the designers of the TOGA note that they have an instrument that combines the fairness of individual intelligence tests and the economy of a group-administered test. The TOGA was written to provide a measure of basic learning ability. While it cannot be entirely culturally free, the attempt has been made to eliminate material based on school-learned skills, such as reading, writing, and arithmetic. The TOGA was normed to represent national norms and on a similar sample used for educational achievement tests. The group also took the Kuhlmann-Anderson Intelligence Test, the California Test of Mental Maturity and the SRA Test of Educational Ability. The mean IQ's from these tests were equally distributed above and below the mean IQ's obtained from the TOGA. The validity of the TOGA rests on its definition of intelligence as basically involving information and reasoning abilities, and an emphasis on test materials that do not require school-learned skills. At grade level nine, a correlation of .74 on an N of 476 was obtained with the Iowa Tests of Educational Development. Correlations between TOGA and achievement tests rose significantly after grade six.

Two methods were used to obtain reliabilities. The Kuder-Richardson Formula 21 yielded a correlation range from .81 to .86 at the TOGA level 9-12. The odd-even split half method, corrected by

the Spearman-Brown yielded a reliability coefficient range from .86 to .89 at the TOGA level 9-12. The publishers explain that the Kuder-Richardson Formula underestimates the reliability of tests with items of unequal difficulty since the formula assumes that all items are equally difficult. In the case of the TOGA, the relatively low correlations between Part I and Part II items are included in the total intercorrelation.

Comprehensive Test of Basic Skills

The reading achievement score was obtained from the Total Reading Score on the Comprehensive Test of Basic Skills, Expanded Edition, Level 4, Form S, which was routinely administered to all students in the high school in April, 1978. The Total Reading Score is comprised of two subtests: vocabulary and comprehension. A Table of Norms is provided to convert the total raw score to a grade equivalent.

The publishers report Kuder-Richardson Formula 20 correlation coefficients ranging from .85 to .95 for the two reading subtests. To insure content validity, test items were written by teachers of the appropriate grades in cooperation with curriculum and testing specialists. Recognizing that performance in these tests depends on possession of relevant knowledge at each grade level, an attempt was made to measure those skills common to all curricula, traditional and experimental. Normative data is derived from a stratified random sample drawn from public and parochial schools within the 50 states, comprising approximately 150,000 students in grades K through 12.

Other Information

The remaining information necessary to compute the expectancy formulas was obtained from each child's cumulative record. This included grade levels, number of years in school and date of birth. Biographical data for formula input is shown in Appendix A. The data was applied to the formulas for each individual. A sample computation for each formula is shown in Appendix B.

Formulas

Dechant Formula

Dechant (1973) believes that the IQ score, although not an absolute measure of potential is the "best we have." It provides, at least, the minimum that can be expected of a student. Dechant's goal is to determine the degree of retardation in a student. To obtain the Reading Age Score (RA) he adds 5 to the Reading Grade Score. This score is then compared to the student's Mental Age ($\frac{CA \times IQ}{100}$), and the difference is the degree of retardation. An example is:

Grade Level Reading Score	Reading Age Score RA	Chronological Age	IQ Score	Mental Age	Difference Between MA & RA
6.3	11.3	14.2	113	16.0 (14.2 x 1.13)	-4.7

This formula works out to the same grade Reading Expectancy as the Harris I Formula (MA - 5.0). The formula as expressed above is to show the degree of retardation.

Harris I Formula

Harris (1961) believed that, while the Bond and Tinker Formula

set expectancies in line with actualities, his Mental Age minus Reading Age formula set expectancies in the ideal sense of each child functioning according to his level of mental development. His formula is:

$$RE = \frac{CA \times IQ}{100} - 5.0$$

The five subtracted represents 6 years before schooling with 1 year subtracted to represent the child's reading grade equivalent as 1.0 not 0.0, when he begins.

TOGA Formula

The TOGA Formula was developed for Science Research Associates in 1957 by John C. Flanagan. The TOGA was developed as a measure of intelligence that is relatively independent of school achievement. The emphasis is on information, including verbal concepts, and reasoning abilities. The Table of Norms, providing grade expectancy is printed on the answer sheet to the Tests of General Ability. By indexing the test score and chronological age, the appropriate expectancy is found. For students above age 15, a Table of Equivalent Chronological Age is provided. To obtain the grade expectancy scores, the author began by equating the separate tests on the five different levels. These equating studies used the method of equal percentiles to develop raw score equivalents. These scores are then converted to mental age equivalents by adding 5.2, the average age of entrance to kindergarten.

Harris II Formula

Harris (1975) has now revised his earlier direct comparison of

Mental Age with Reading Age. He feels that his new formula is more accurate, particularly in three circumstances:

> 1) when there are more candidates for remedial help than can be accommodated and one wants to set up a rank order for degree of severity of the problem; 2) when one needs a statistical measure of degree of disability for use in research; and 3) when one wants to check whether or not remedial help is bringing children closer to their expected reading levels. (p. 151)

Harris' new formula gives more weight to general maturing, which alters a variety of traits that enter into the prediction of reading performance. These include visual and auditory perception, general information, grasp of linguistic and syntactic relationships, vocabulary, and amount of reading instruction and practice. The formula is:

$$\text{Reading Expectancy Age (R Exp A)} = \frac{2\,MA + CA}{3}$$

Both Mental Age and Chronological Age are to be expressed in years and tenths. To convert R Exp A to expectancy grade equivalent subtract 5.2 years. This formula is the same as that described by Horn for ages 10 years, 0 months through 11 years, 11 months.

Los Angeles Formula

Torgerson and Adams (1954) recommended the Los Angeles Formulas developed by Alice Horn. These formulas combine reading age and chronological age in proportions that vary with age levels. Mental age becomes more important in the ratio, as the child grows older, the effect of developed attention span, coordination, emotional maturity, social adjustment, and work habits. There is the assumption, in these formulas, that bright children achieve below their mental ages and

that dull children achieve above their mental age levels. For children age 12 and over the formula is:

$$RE = \frac{3\ MA + CA}{4}$$

The Expectancy Age can then be converted into an expected grade placement by the use of the age-grade equivalents table.

Bond and Tinker Formula

Bond and Tinker (1957), using data from an unpublished study of Bond and Clymer, indicate that the relationship between IQ and reading achievement is the most valid one. IQ and reading achievement were obtained by use of the Stanford-Binet Intelligence Test and the Gates Reading Survey Test on 379 fifth-grade students in a large midwestern city. Based on this study, Bond and Tinker developed their formula for Reading Expectancy:

$$RE = (\text{Years in School} \times \frac{IQ}{100}) + 1.0$$

The one year is added because the grade score is 1.0 when a child enters school.

This formula gives higher expectations than does the Mental Age formulas, for children of lower IQ's; and the formula gives lower expectations for children of higher IQ's. Although Harris (1975) admits that this formula comes closer to actual accomplishments in schools today, he questions whether we demand enough of our bright youngsters while we unduly burden our duller pupils.

Treatment of Data

Each of the six reading expectancy scores was correlated with the obtained reading achievement score for each student, using the Pearson product-moment correlation coefficient (Lyman, 1963). Each expectancy score was then correlated with every other expectancy score to determine the inter-correlation of formulas.

CHAPTER IV

RESULTS OF THE STUDY

Explanation of Tables

Table 2 summarizes the means, standard deviations, and correlations between each expectancy formula and actual reading achievement for grade 9. Inspection of Table 2 shows that the correlations range between .43 and .51. In addition the correlations are all significant at the 5% level of confidence.

Table 3 summarizes the means, standard deviations, and correlations between each expectancy formula and actual reading achievement for grade 10. The range for grade 10 is from .70 to .73. The correlations are all significant at the 5% level of confidence.

Table 4 and Table 5 present the correlation between the six expectancy formulas for grades 9 and 10, respectively. The range of correlation for both tables is between .88 and .99.

Discussion

This study differs from previous studies in not finding one of the formulas to be a better predictor of actual reading achievement in a particular grade. The high intercorrelations between the formulas may be explained by the fact that they are all based on some combination of the Mental Age and Chronological Age except the Bond and Tinker which substitutes Years in School for Chronological Age.

TABLE 2

MEANS, STANDARD DEVIATIONS AND CORRELATIONS OF EXPECTANCY FORMULAS WITH ACTUAL READING ACHIEVEMENT
(Grade 9, N=56)

Formula	Mean (grade)	S.D. (grade)	Correlation*
Dechant and Harris I	11.4	2.4	.48
TOGA	11.1	1.9	.45
Harris II	10.7	1.7	.45
Los Angeles	10.6	1.8	.43
Bond and Tinker	10.7	1.5	.51

*For 54 degrees of freedom a correlation of .26 is needed for the .05 level of confidence.

TABLE 3

MEANS, STANDARD DEVIATIONS AND CORRELATIONS OF EXPECTANCY FORMULAS WITH ACTUAL READING ACHIEVEMENT
(Grade 10, N=38)

Formula	Mean (grade)	S.D. (grade)	Correlation*
Dechant and Harris I	12.4	2.0	.71
TOGA	11.3	1.8	.73
Harris II	11.8	1.5	.70
Los Angeles	11.7	1.5	.70
Bond and Tinker	11.8	1.1	.70

*For 36 degrees of freedom a correlation of .33 is needed for the .05 level of confidence.

TABLE 4

CORRELATIONS AMONG THE SIX READING EXPECTANCY FORMULAS
(Grade 9, N 56)

Formula	Dechant and Harris I	TOGA	Harris II	Los Angeles	Bond and Tinker
Dechant and Harris I	---	.93	.94	.99	.97
TOGA		---	.88	.92	.93
Harris II			---	.93	.91
Los Angeles				---	.96
Bond and Tinker					---

TABLE 5

CORRELATIONS AMONG THE SIX READING EXPECTANCY FORMULAS
(Grade 10, N 38)

Formula	Dechant and Harris I	TOGA	Harris II	Los Angeles	Bond and Tinker
Dechant and Harris I	---	.92	.99	.99	.96
TOGA		---	.92	.92	.95
Harris II			---	.99	.86
Los Angeles				---	.95
Bond and Tinker					---

Bragg (1971) found the Los Angeles Formula to be the better predictor while the Harris I had an extremely low correlation of .08.

Gore-Boyce et al. (1975) found none of the correlations significant at the IQ interval 70-89. For all IQ's over 90, however, they found that the Harris I was the best predictor of reading achievement.

Simmons and Shapiro (1968) found the Los Angeles Formula to be midway between the Harris I, which provided the highest expectancies in the upper IQ range and the Bond and Tinker, which gave the highest expectancies in the lower IQ range.

In this present study the Bond and Tinker gave the highest expectancy at a low IQ level while giving the lowest expectancy at a high IQ level. This is essentially in accordance with Harris' (1975) comments on this formula. In the middle IQ range the expectancies are closer to each other. The TOGA and the Dechant/Harris I give the highest expectancy in the middle and upper ranges. The TOGA has a built in ceiling effect since all scores after 12.8 are considered college level and are entered as 12.8 . Although the ceiling effect is a limitation to correlating a formula with the reading score, in actuality a score in this range would not be one that would be involved in the selection process for possible remediation at the high school level.

Bond and Tinker (1957) selected IQ as a measure of rate of learning in preference to MA as an indicator of the attained level of intellectual maturation. In this study of average classes on a high school level much of the variance between these factors and reading score is unaccounted for. Although this study as well as the studies

reviewed found statistically significant correlations, the amount of variance accounted for was far less than unity. More specifically, the range of overlap was from 18% to 26% at grade 9 and from 49% to 53% at grade 10.

As Strang (1969) pointed out, other factors such as concentration, attention, motivation, attitudes, values and self-concept must all be considered to a greater degree at the high school level. We do not know whether the reading score is affecting the predictor score, the predictor score is affecting the reading score or whether some other variable is affecting both. Essentially, the reading test as well as the IQ test are measuring the accumulated knowledge of the student.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The two questions asked in this study were:

1. What was the relationship between each of the expectancy formulas and reading achievement as it related to average ninth and tenth graders in a middle class group?

2. What was the relationship between the six expectancy formulas?

The six formulas used to predict reading potential were:

1. Dechant Formula;

2. Harris I Formula;

3. Science Research Associates' Tests of General Ability, referred to as the TOGA Formula;

4. Harris II Formula;

5. Los Angeles Formula; and

6. Bond and Tinker Formula.

The tests used in this study were the Science Research Associates' Tests of General Ability for grades 9-12, and the Comprehensive Tests of Basic Skills, Expanded Edition, Level 4, Form S.

In reference to the first question, it was found that no one formula predicted reading achievement any better, at a particular grade level, than any other since the correlation ranged between .43 and .51

at grade 9 and .70 and .73 at grade 10.

In reference to the second question, the correlations ranged from .88 to .99, indicating that essentially all the formulas appear to be assessing the same phenomena.

Suggestions for Further Research

This study was done using average middle class groups. It could be repeated on a different sample. One particular comparison might be using students programmed in below average or remedial groups. This may eliminate many of the ceiling effects found in the average groups.

The measure of IQ in this study was the TOGA. There is the possibility that different results might be obtained using another IQ test.

Additional formulas, such as Cleland and the Durrell-Listening Reading Test could be compared with actual reading achievement.

Studies analyzing other variables involved in reading achievement should be done. Such variables as motivation and interest may provide additional basis for choosing students to participate in a remedial program.

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APPENDIX A

BIOGRAPHICAL DATA AND EXPECTANCY GRADES

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
1	9	15.2	83	12.6	7.3	7.6	7.6	7.3	8.3	7.9	8.5
2	9	15.0	116	17.4	10.1	12.4	12.4	12.8+	11.4	11.3	11.4
3	9	15.6	139	21.7	13.4	16.8	16.8	12.8+	14.5	14.8	13.5
4	9	15.5	106	16.5	6.0	11.5	11.5	11.8	11.0	10.9	10.5
5	9	15.4	122	18.8	11.0	13.8	13.8	12.8+	12.5	12.7	12.0
6	9	15.9	113	18.0	12.4	13.0	13.0	12.8+	12.1	12.1	11.2
7	9	14.7	82	12.1	6.8	7.1	7.1	6.9	7.8	7.3	8.4
8	9	15.0	101	15.2	8.9	10.2	10.2	10.3	9.9	9.8	10.1
9	9	15.3	107	16.4	11.0	11.4	11.4	11.5	10.8	10.7	10.6
10	9	15.2	106	16.1	11.7	11.1	11.1	11.2	10.6	10.4	10.5
11	9	15.2	107	16.3	9.1	11.3	11.3	11.5	10.7	10.7	10.6
12	9	14.4	121	17.4	10.8	12.4	12.4	12.8	11.2	11.2	11.9
13	9	14.7	97	14.3	10.0	9.3	9.3	9.1	9.2	9.0	9.7

BIOGRAPHICAL DATA AND EXPECTANCY GRADES -- Continued

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
14	9	15.1	109	16.5	8.3	11.5	11.5	11.8	10.8	10.8	10.8
15	9	14.7	109	16.0	10.5	11.0	11.0	11.2	10.3	10.2	10.8
16	9	15.1	97	14.7	12.4	9.7	9.7	9.6	9.6	9.3	9.7
17	9	14.7	123	18.1	11.8	13.1	13.1	12.8+	11.8	11.9	12.1
18	9	15.4	122	18.8	13.6	13.8	13.8	12.8+	12.5	12.7	12.0
19	9	15.1	113	17.1	13.6	12.1	12.1	12.8	11.2	11.2	11.2
20	9	14.6	100	14.6	11.5	9.6	9.6	9.6	9.4	9.2	10.0
21	9	14.7	126	18.5	12.4	13.5	13.5	12.8+	12.0	12.2	12.3
22	9	15.8	92	14.5	9.1	9.5	9.5	9.1	9.7	9.3	9.3
23	9	15.2	83	12.6	9.8	7.6	7.6	7.3	8.3	7.9	8.5
24	9	15.6	111	17.3	11.2	12.3	12.3	12.1	11.5	11.4	11.0
25	9	15.2	119	18.1	13.6	13.1	13.1	12.8+	12.0	12.0	11.7
26	9	15.5	92	14.3	9.6	9.3	9.3	8.8	9.5	9.2	9.3
27	9	15.0	103	15.5	12.4	10.5	10.5	10.6	10.1	10.0	10.3

BIOGRAPHICAL DATA AND EXPECTANCY GRADES -- Continued

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
28	9	15.2	113	17.2	10.1	12.2	12.2	12.8	11.3	11.2	11.2
29	9	15.8	104	16.4	11.5	11.4	11.4	11.2	11.0	10.9	10.4
30	9	15.3	86	13.2	10.5	8.2	8.2	7.8	8.7	8.2	8.7
31	9	15.4	113	17.4	11.7	12.4	12.4	12.8	11.5	11.4	11.2
32	9	14.7	132	19.4	13.6	14.4	14.4	12.8+	12.6	12.8	12.9
33	9	14.8	100	14.8	8.9	9.8	9.8	9.6	6.3	9.3	10.0
34	9	14.6	88	12.8	10.1	7.8	7.8	7.8	8.2	7.9	8.9
35	9	15.4	113	17.4	11.8	12.4	12.4	12.8	11.5	11.4	11.2
36	9	15.6	119	18.6	9.4	13.6	13.6	12.8+	12.4	12.4	11.7
37	9	15.2	99	15.1	11.7	10.1	10.1	9.9	10.0	9.7	9.9
38	9	15.2	113	17.2	10.1	12.2	12.2	12.8	11.3	11.2	11.2
39	9	14.6	111	16.2	13.6	11.2	11.2	11.5	10.5	10.3	11.0
40	9	15.3	99	15.2	10.7	10.2	10.2	9.9	10.0	9.8	9.9
41	9	15.1	116	17.5	11.4	12.5	12.5	12.8+	11.5	11.4	11.5

BIOGRAPHICAL DATA AND EXPECTANCY GRADES -- Continued

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
42	9	15.4	90	13.9	7.7	8.9	8.9	8.6	9.2	8.9	9.1
43	9	14.7	100	14.7	13.4	9.7	9.7	9.6	9.5	9.2	10.0
44	9	15.2	116	17.6	13.6	12.6	12.6	12.8+	11.6	11.7	11.4
45	9	15.3	119	18.2	8.3	13.2	13.2	12.8+	12.0	12.1	11.7
46	9	15.9	123	19.6	13.6	14.6	14.6	12.8+	13.2	13.2	12.1
47	9	14.7	106	15.6	7.9	10.6	10.6	10.6	10.1	10.0	10.5
48	9	16.2	105	16.7	8.5	11.7	11.7	11.5	11.3	11.2	10.5
49	9	15.0	103	15.5	12.6	10.5	10.5	10.6	10.1	10.0	10.3
50	9	15.4	113	17.4	11.1	12.4	12.4	12.8	11.5	11.4	11.2
51	9	15.1	105	15.9	8.3	10.9	10.9	10.9	10.4	10.2	10.5
52	9	15.0	111	16.7	10.2	11.7	11.7	12.1	10.9	10.9	11.0
53	9	15.0	128	19.2	9.6	14.2	14.2	12.8+	12.6	12.8	12.5
54	9	15.9	102	16.2	11.4	11.2	11.2	10.9	10.9	10.7	10.2
55	9	15.8	88	13.9	5.5	8.9	8.9	8.6	9.3	9.0	8.9
56	9	15.2	109	16.6	12.0	11.6	11.6	11.8	10.9	10.9	10.8

BIOGRAPHICAL DATA AND EXPECTANCY GRADES

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
1	10	16.4	118	19.4	12.7	14.4	14.4	11.8	13.2	13.2	11.4
2	10	15.8	94	14.9	8.0	9.9	9.9	9.4	10.0	9.7	10.4
3	10	16.2	81	13.1	8.4	8.1	8.1	7.3	8.9	8.4	9.1
4	10	15.6	92	14.4	11.2	9.4	9.4	8.8	9.6	9.2	10.2
5	10	16.6	131	21.8	13.6	16.8	16.8	12.8+	14.9	15.1	14.1
6	10	16.4	114	18.7	11.4	13.7	13.7	12.8+	12.7	12.7	12.4
7	10	16.0	94	15.0	9.1	10.0	10.0	9.4	10.1	9.9	10.4
8	10	15.8	113	17.9	11.8	12.9	12.9	12.8+	12.0	12.0	12.3
9	10	16.9	93	15.7	9.1	10.7	10.7	9.6	10.9	10.7	10.3
10	10	16.2	122	19.8	9.4	14.8	14.8	12.8+	13.4	13.4	13.2
11	10	16.1	90	14.5	8.8	9.5	9.5	8.8	9.8	9.4	10.0
12	10	15.8	131	20.7	9.9	15.7	15.7	12.8+	13.9	14.1	14.1
13	10	15.9	113	18.0	11.1	13.0	13.0	12.8+	12.1	12.1	12.3
14	10	16.0	113	18.1	13.6	13.0	13.0	12.8	12.2	12.2	12.3

BIOGRAPHICAL DATA AND EXPECTANCY GRADES -- Continued

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
15	10	17.3	86	15.0	5.5	10.0	10.0	8.6	10.6	10.2	9.6
16	10	15.6	122	19.0	10.6	14.0	14.0	12.8 +	12.7	12.8	13.2
17	10	16.1	78	12.6	6.8	7.6	7.6	6.9	8.5	8.1	8.8
18	10	15.6	119	18.6	13.6	13.6	13.6	12.8 +	12.4	12.4	12.9
19	10	15.7	90	14.1	7.7	9.1	9.1	8.6	9.4	9.1	10.0
20	10	15.4	119	18.3	11.7	13.3	13.3	12.8 +	12.1	12.2	12.9
21	10	16.6	111	18.4	11.1	13.4	13.4	12.8 +	12.6	12.7	12.1
22	10	15.6	131	20.4	13.6	15.4	15.4	12.8 +	13.6	13.8	14.1
23	10	16.2	105	17.0	9.4	12.0	12.0	11.5	11.5	11.3	12.5
24	10	15.8	92	14.5	6.4	9.5	9.5	9.1	9.7	9.3	10.2
25	10	16.2	113	18.3	10.8	13.3	13.3	12.8	12.4	12.3	12.3
26	10	15.8	120	19.0	12.5	14.0	14.0	12.8 +	12.7	12.8	13.0
27	10	16.2	131	21.2	12.7	16.2	16.2	12.8 +	14.3	14.7	14.1
28	10	16.6	114	18.9	13.4	13.9	13.9	12.8 +	12.9	12.9	12.4

BIOGRAPHICAL DATA AND EXPECTANCY GRADES -- Continued

Subject	Grade	CA	IQ	MA	RS	Dechant	Harris I	TOGA G.E.	Harris II	Los Angeles	Bond & Tinker
29	10	16.4	109	17.9	12.0	12.9	12.9	12.8	12.2	12.1	11.9
30	10	16.6	117	19.4	13.6	14.4	14.4	12.8+	13.3	13.2	12.7
31	10	15.7	105	16.5	8.8	11.5	11.5	10.9	11.0	10.9	11.5
32	10	16.7	100	16.7	12.0	11.7	11.7	10.9	11.5	11.2	11.0
33	10	15.8	84	13.3	10.4	8.3	8.3	7.8	8.9	8.4	9.4
34	10	15.7	94	14.8	9.9	9.8	9.8	9.1	9.9	9.7	10.4
35	10	15.7	131	20.6	13.6	15.6	15.6	12.8	13.8	14.0	14.1
36	10	16.2	120	19.4	10.5	14.4	14.4	12.8+	13.1	13.2	13.0
37	10	15.7	106	16.6	11.5	11.6	11.6	11.2	11.1	11.0	11.6
38	10	16.6	117	19.4	10.4	14.4	14.4	12.8+	13.3	13.2	12.7

APPENDIX B

EXAMPLES OF FORMULA COMPUTATIONS

Subject #55 Grade 9

Chronological Age	15.8
IQ	88
Reading Score	5.5
Years in School	9

Dechant

Reading Grade Score + 5 = Reading Age Score

5.5 + 5 = 10.5

Mental Age - Reading Age Score = Degree of Retardation

13.9 - 10.5 = -3.4

Reading Grade Score + Degree of Retardation = Expectancy Level

5.5 + 3.4 = 8.9

Harris I

$$RE = \frac{CA \times IQ}{100} - 5.0$$

$$RE = \frac{15.8 \times 88}{100} - 5.0$$

$$RE = 13.9 - 5.0$$

$$RE = 8.9$$

Harris II

$$RE\ Age = \frac{2\ MA + CA}{3}$$

$$RE\ Age = \frac{2\ (13.9) + 15.8}{3}$$

$$RE\ Age = \frac{43.6}{3}$$

$$RE\ Age = 14.5$$

This is converted to expectancy grade equivalent by subtracting 5.2.

$$RE = 14.5 - 5.2$$

$$RE = 9.3$$

Los Angeles

$$RE = \frac{3\,MA + CA}{4}$$

$$RE = \frac{3\,(13.9) + 15.8}{4}$$

$$RE = \frac{57.5}{4}$$

$$RE = 14.4$$

This converts to an expected grade placement of 9.0

Bond and Tinker

$$RE = (\text{Years in School} \times \frac{IQ}{100}) + 1.0$$

$$RE = (9 \times \frac{88}{100}) + 1.0$$

$$RE = 7.9 + 1.0$$

$$RE = 8.9$$